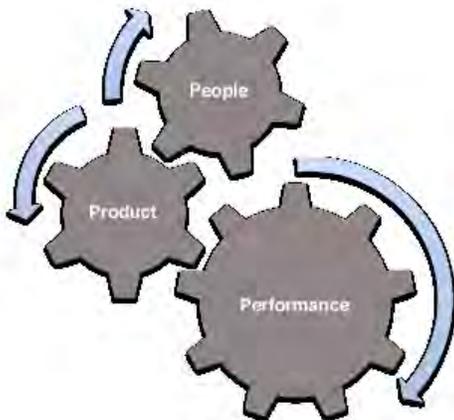




SERVICE MANUAL

HG-1-1501
1-Million Btu/Hr
Gas-Fired Heater
Service and Operation Guide



SAMUEL JACKSON

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*We appreciate your business and hope you enjoy your
Samuel Jackson Gas-Fired Heater*

This manual contains information on the installation, startup, and operation of your heater. Included is information on:

- Electrical installation.
- Gas piping and supply.
- Heater dimensions.
- Maintenance and troubleshooting.

This manual gives general information on the location of the temperature sensing thermocouple. If the heater is part of a Samuel Jackson Super Grid System or a Samuel Jackson Steamroller System, more detailed information will be shipped to you under separate cover specifically for your system.

IS STARTUP ASSISTANCE PROVIDED?

Depending upon your location, a startup and inspection service may be provided with your new heater, free of charge, by Samuel Jackson, Inc. Please contact us to make arrangements or for questions.

In the future when you require service, technical support or parts, contact us by phone, fax or email. Our engineers and service people are available to assist you in obtaining the best performance from your Samuel Jackson, Inc. products.

Again, thanks for choosing a Samuel Jackson Gas-Fired Heater.

SAMUEL JACKSON, INCORPORATED
3900 UPLAND AVENUE LUBBOCK, TEXAS 79407
TELEPHONE +1-806-795-5218 OR 800-862-9966
TELEFAX +1-806-795-8240
Email: engineering@samjackson.com
Internet: www.samjackson.com



READ THIS CAREFULLY BEFORE OPERATING THIS SAMUEL JACKSON PRODUCT!

The Samuel Jackson product line consists of sophisticated technology capable of greatly enhancing a gin's productivity and efficiency. Improper use of these products could adversely affect those very same factors and potentially cause injury to gin personnel. For this reason, we include an extensive manual with every product. These manuals outline the proper and safe operating procedure for their respective product. **Do not operate any Samuel Jackson product without first reading the entire manual and all accompanying information.**

Sometimes there are updates added at the customer's discretion to products already in the field. We always refer customers to our website, www.samjackson.com for the latest product information. The latest manual can be downloaded or printed from the website free of charge. In addition to printed literature, the website includes training videos on several popular products. When available, these videos are highly recommended for viewing before operating a respective product. If you do not have internet access, give us a call and we will gladly send you the latest product information.

DANGER: Please read and understand all the warnings below before operating or maintaining a Samuel Jackson product. If you do not understand, call Samuel Jackson at 806-795-5218 before proceeding. Failure to do so could result in injury or even death. (Si usted no entiende, llamar a Samuel Jackson en 806-795-5218 antes de proceder. La falta de hacer tan podía dar lugar a lesión o aún a muerte.)

Electrical.

Most Samuel Jackson products use supply voltage between 110 and 480 volts AC. These levels are considered high voltage and are extremely dangerous. The ignition transformer voltage output is much higher than this.

Fire.

Samuel Jackson Humidair Units and Heaters are combustion-based products. They ignite and burn fuel during operation. These products can reach very high temperatures inside and out. Allow combustion based products 15 minutes to cool before attempting any work.

Automatic Flame Ignition.

Some Samuel Jackson Humidair Units and Heaters use technology to ignite automatically. If you do not see a flame, it does not mean that respective product is not in operation.

Access Doors.

Samuel Jackson products have access doors for added convenience of product maintenance. Access doors must not be opened while the equipment is in operation. Access doors should also remain closed while any connected equipment such as a fan or conveyor is in operation.

Moving Parts.

Many Samuel Jackson products have moving or rotating parts. These parts could form pinch points or grab loose clothing or jewelry. Do not reach across or into any product while in operation.

Replacement Parts.

When repairing or maintaining this equipment, use only Samuel Jackson approved parts.

Do not work on any Samuel Jackson product without first following OSHA Lockout/Tagout procedures. Confirmation by a licensed electrician that there is no electricity present is highly recommended. We recommend using a Samuel Jackson Authorized Technician for all work Samuel Jackson products. Additional safety information is located throughout this manual and should be read carefully before operating this Samuel Jackson product. If you have any questions about how to properly operate a Samuel Jackson product, please call +1-806-795-5218 before proceeding.

INTRODUCTION

Cold weather and trashy cotton take a toll on the performance of lint moisture restoration machinery. An independent source of hot dry air to keep condensation and buildup to a minimum is a necessity. The HG-1-1501 1-million BTU/hr Gas-Fired Heater was developed to meet this need. It comes complete with blower fan & motor to make installation fast and simple. The heater provides up to 3,000 CFM of closely regulated hot air. The heater has PLC combustion and temperature controls with error & alarm logging to make troubleshooting easy. Little external wiring is required for hookup.

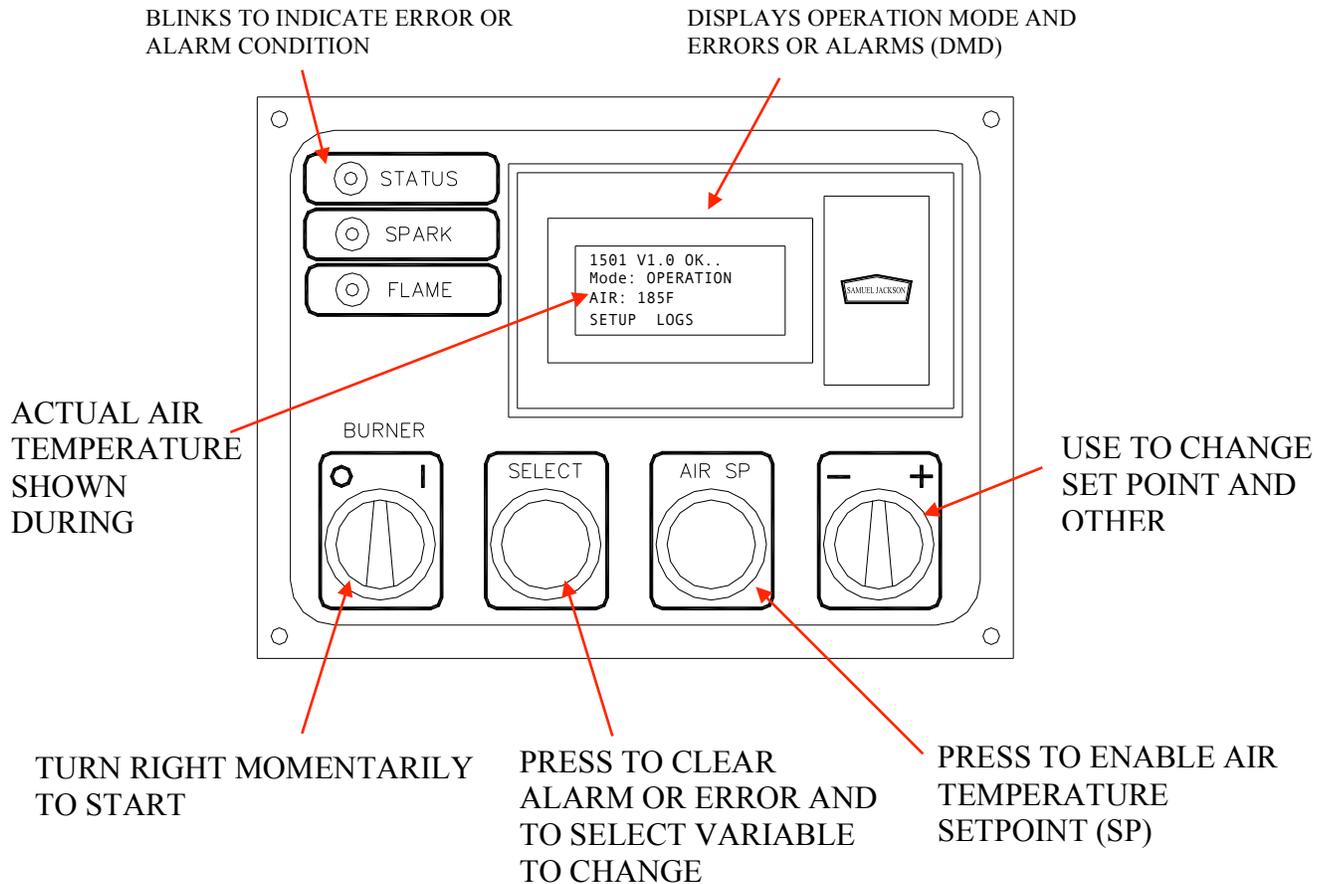


HG-1-1501 GAS-FIRED HEATER

HEATER OPERATION

HOW DO I TURN IT ON?

The heater is turned on by momentarily turning the START-STOP (O - I) selector switch to the right and releasing it. This is done at the LOCAL PANEL (LP) in the heater's upper cabinet. The wiring electrician may have installed an optional remote START-STOP switch at the console which can also be used for start/stop.



Local Panel LP

4376

After the START-STOP switch is turned and released, observe the Diagnostic Module Display DMD. The heater's blower will start and various operations will be displayed as the self-checks and ignition sequence are performed. The STATUS light will remain on throughout this process. After approximately 20 seconds, the burner will attempt ignition. If ignition fails, the heater controls will automatically make two more attempts following appropriate air purge delays.

WHY IS THERE A DELAY AFTER I TURN IT ON?

When the STATUS light comes on, the PLC begins opening and closing valves to test the integrity of various safety switches located in the heater's control cabinet. If it finds a problem with one of these devices, it alerts the operator on the display with a description of the problem.

These diagnostics are performed every time the heater is started and continue during operation until approximately 10 minutes after the heater is turned off. The status of post-burn testing is shown on the display with the time remaining.



TIPS

Always leave power on the heater during gin season. There is a permanent memory in the PLC that remembers when you turned off the power and did not permit the computer to check the gas valves. It will result in ERROR 140 after 6 shutdowns with no leak check.

To prevent lightning damage to the controls in the off season, it is a good idea to turn 3 phase power off to the control cabinet until it is needed again.

ALARMS and ERRORS are fully described later in this manual. A description will also be found on a decal in the burner cabinet. The decal will be helpful when reviewing error history of the heater as only time, date, and error number are displayed. ALARMS will warn the operator of an impending problem and ERRORS will cause an immediate shutdown.

WHAT ARE THE TESTS AND SETUP PROGRAMS?

The TESTS and SETUP programs can be activated by a qualified service man or trained user to test the heater and make custom settings. They are always performed at the Samuel Jackson factory before shipment of a new heater and occasionally in the field, when necessary, for troubleshooting. The TESTS program allows the service man to proceed through a set of tests where individual components of the heater can be tested, calibrated, and adjusted.

The TESTS program is described fully in the *TESTS EXPLANATION* section of the manual. The SETUP program is explained in the *SETUP EXPLANATION* section of the manual.

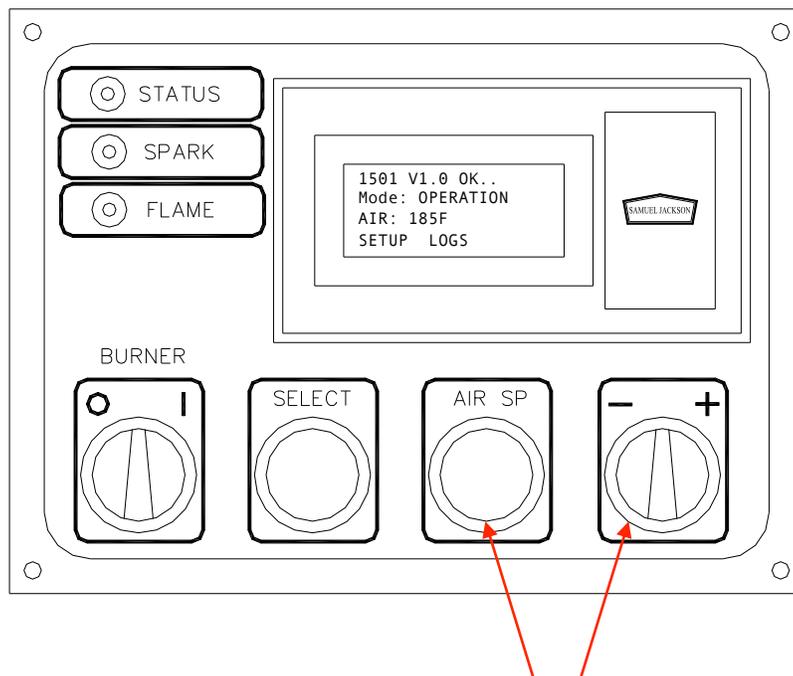
WHAT ARE THE GAS LEAK TESTS?

Every time the heater is turned off, one of two gas leak tests will be performed automatically. The heater will alternate between the two tests after each normal shut down. The test takes about 10 minutes to perform and the status of the tests is shown on the Diagnostic Module Display DMD in the control cabinet. Leak Test 1 checks the integrity of the safety shut off valve SSOV1. With gas evacuated from between the valves in the gas train, if gas builds up pressure and closes the gas low pressure switch GLPS, then gas is leaking past the “upstream” SSOV1. For Leak Test 2, the gas train is charged with gas at the start of the test so the gas low pressure switch GLPS is closed. If gas leaks out of the gas train through the Pilot Valve PV, “downstream” SSOV2 or

fittings, then the GLPS will open and a downstream leak exists. An ERROR will be displayed if one of these two tests fail. See the *ERROR & ALARM EXPLANATIONS* section for ERRORS 136 and 137. Power must be left on to the heater for at least 10 minutes after shutdown for these tests to be performed. The heater can be restarted at any point during the test.

HOW DO I SET THE TEMPERATURE?

The set point (SP) for the air temperature is set using the AIR SP button and the +/- selector switch on the Local Panel LP (see below). To change the air temperature set point, press and hold the AIR SP button while using the +/- selector switch to raise or lower the desired set point temperature. Release the AIR SP button when the desired set point is shown. Changing the SP can be done with the heater on or off. The range that the set point can be adjusted to depends on the minimum and maximum set point settings that have been made in the SETUP steps. See *SETUP EXPLANATION* section of the manual for more details on setting the ranges.



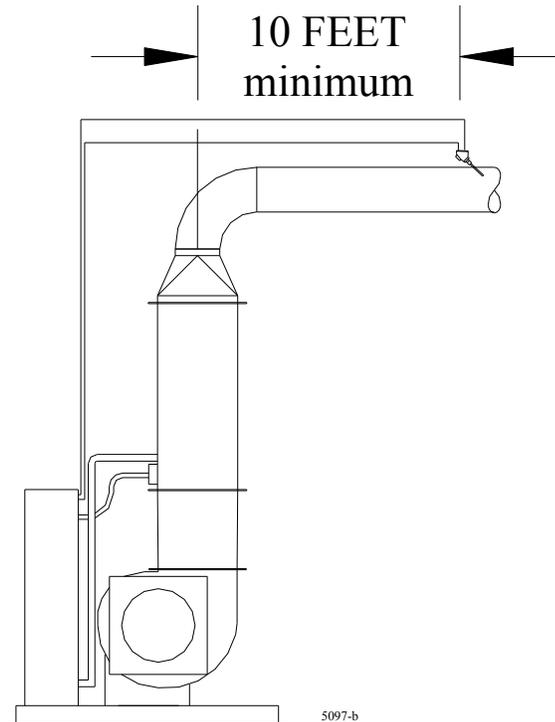
**TO ADJUST TEMPERATURE SET
POINT (SP) PRESS AIR SP
BUTTON AND TURN +/-**

Setting Air Temperature Set Point (SP)

4376

WHERE DO I INSTALL THE AIR TEMPERATURE SENSING THERMOCOUPLE?

A thermocouple with blue paint on the pipe threads (Part No. 21708) is supplied for installation in the hot air duct after the heater. Place it **at least** 10 feet away from the outlet of the heater. If the heater is part of a Samuel Jackson Super Grid System or a Samuel Jackson Steamroller System, more detailed information will be supplied to you under separate cover specifically for your system. See *THERMOCOUPLE WIRING* section for more details.



OPTIONAL MOISTURE MIRROR 3X OR 4X FOR REMOTE CONTROL

The HG-1-1501 Heater is compatible with the optional Moisture Mirror 3X and 4X offering remote control (normally at the ginner's console) of the heater via a CAT5 Ethernet connection. The START/STOP operations, temperature settings and information like run times are displayed on the Mirror's color touch panel. When an ERROR or ALARM occurs, this information is also displayed.

More information will be found in the manuals for the Moisture Mirror 3X and 4X. The Mirror 3X screen for the HG-1-1501 Heater is shown below.



ERROR & ALARM LOGGING SYSTEM

The *ERROR & ALARM LOGGING SYSTEM* is designed to make troubleshooting easier for both the user and Samuel Jackson service personnel. This system remembers the last 500 ERRORS and ALARMS, thus showing a history of past problems. The alphanumeric Diagnostic Module Display (DMD) located in the Local Panel LP shows the code number for the ERROR or ALARM along with the month, day and time of occurrence.

Access to the logging system is easy and can be done when the burner is on or off. Turn the +/- switch until the blinking cursor is over LOGS. Press the SELECT button once. Then use the +/- switch to scroll through until ERRORS/ALARMS is shown. Press SELECT again. **Error Log #001** will be shown first. Use the +/- switch to increment (+) to earlier logs or decrement (-) to the latest. Log entries are in a first-in first-out stack, therefore Error Log #500 is replaced when another log event occurs.

A typical Error Log display is shown below. Error Log #002 is shown with a code of 121 that occurred on 08/19 (August 19) at 16:49 (4:49 PM). Referring to the DIAGNOSTIC CODES decal located on the heater cabinet door, Code 121 is an ALARM that air flow went off for a moment. A more detailed description of the codes are given in the *ERROR & ALARMS EXPLANATIONS* section of the Service Manual. For the Error Log, no distinction is made between ALARMS or ERRORS.



Error Log Display

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To quickly advance through earlier logs, press the SELECT button while in the logging system. Each press of the SELECT button will increment the log number to the next 50th entry. There are two ways to exit the logging system. Turn the +/- switch to the left (-) and hold for 5 seconds. Then use the same switch to choose BACK and press SELECT once. Also, the display will change back to the normal operation mode screen after two minutes of inactivity.

OTHER LOGS “FLAME ON TIMER”

The **LOGS** system does more than just monitor and display problems. It also displays the heater run time for each month the heater is operated during a year. These times can be used to determine regular maintenance intervals.

Access to this step is easy and can be done when the burner is on or off. Turn the +/- switch until the blinking cursor is over LOGS. Press the SELECT button once. Then use the +/- switch to scroll through until FLAME ON TIMER is shown. Press SELECT again.

The +/- switch is now used to scroll from month to month. When you are finished viewing the times, press SELECT to quit the FLAME ON TIMER step, then use +/- to select BACK. Press SETUP to exit the LOGS.

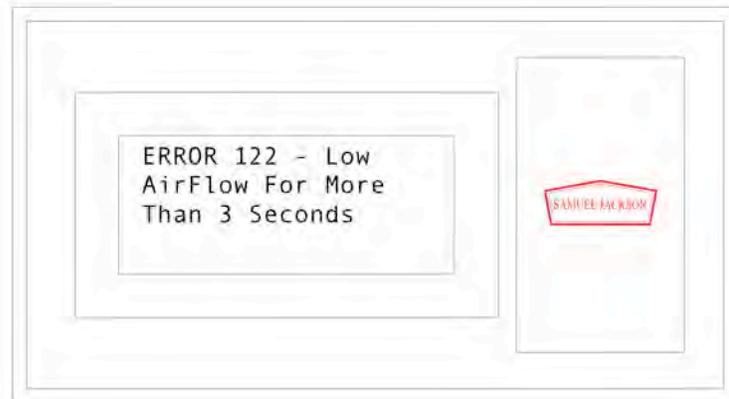
HG-1-1501 DIAGNOSTIC CODES (ERRORS SHUT DOWN BURNER, ALARMS WARN UNTIL ACKNOWLEDGED)		
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<u>CODE</u>	<u>ERR/ALM</u>	<u>BRIEF DESCRIPTION</u>
101	E	BLOWER MOTOR OVERLOAD.
120	E	RESTART NOT PERMITTED BECAUSE AIR FLOW SWITCH HAS NOT BEEN OFF IN 24 HOURS. CHECK OPERATION OF AIR FLOW SWITCH.
121	A	MOMENTARY LOW AIR FLOW. ADVANCE WARNING OF POSSIBLE CHOKE-UP.
122	E	AIR FLOW WENT OFF FOR MORE THAN 3 SECONDS. LOOK FOR CHOKE-UP.
125	E	GAS LOW PRESSURE. CHECK FOR CLOSED VALVE OR VAPORIZER MALFUNCTION.
126	E	GAS HIGH PRESSURE. CHECK FOR GAS REGULATOR MALFUNCTION.
130	E	GAS LOW PRESSURE SWITCH FAILED TO OPEN WHEN NO GAS WAS PRESENT. CHECK OPERATION OF GLPS AND SSOV.
131	E	USER SPECIFIED TIME FOR SHUTDOWN.
134	E	CHECK GAS SUPPLY AND OPERATION OF SSOV1.
136	E	GAS VALVE LEAK, UPSTREAM. CHECK SSOV1.
137	E	GAS VALVE LEAK, DOWNSTREAM. CHECK SSOV2 & PV.
140	E	RESTART NOT PERMITTED. NO LEAK TEST PERFORMED FOR PAST SIX SHUTDOWNS.
142	E	AIR FLOW SWITCH IS ON WITHOUT BLOWER ON. CHECK OPERATION OF AIR FLOW SWITCH.
144	E	EXCESSIVE FLAME FAILURES. THREE OCCURRENCES OF 146 OR 151.
146	A	FLAME NOT ESTABLISHED.
151	A	FLAME FAILED IN OPERATION.
153	E	FLAME SIGNAL BEFORE SPARK AND BEFORE FUEL.
155	E	FLAME SIGNAL DURING SPARK BEFORE FUEL. LOOK FOR ELECTRICAL INTERFERENCE BETWEEN SPARK AND FLAME WIRES.
164	E	AIR THERMOCOUPLE BURNOUT.
166	E	SSOV1 FAILED. POC SWITCH NOT SATISFIED.
170	†ALERT	LOW PLC BATTERY.
171	E	HIGH TEMPERATURE DOWNSTREAM.
172	A	FLAME SIGNAL LASTS TOO LONG AFTER SHUTDOWN.
174	E	CONSTANT AIR TEMP > 60 SECONDS. CHECK THERMOCOUPLE WIRING AND THERMOCOUPLE INPUT CARD.
177	E	POWER FAULT DURING OPERATION.

† ALERTS ARE NOT LOGGED

ERROR & ALARM EXPLANATIONS

PRELIMINARIES -- As explained in the *Heater Operation* section, ERRORS will cause the burner to automatically shut down. ALARMS will permit the burner to continue operation but warn of conditions which may cause a shutdown if left unattended. In each case, the DIAGNOSTIC CODE with a brief description of the ERROR or ALARM will be shown on the display screen DMD located on the Local Panel LP in the heater cabinet.



ERROR & ALARM Condition Display

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The display will continue to show the ALARM or ERROR until the SELECT button is pressed. Only one ALARM or ERROR condition is displayed at a time. The oldest unacknowledged ALARM condition is shown even if the burner shuts down due to an ERROR. Pressing the SELECT button will show consecutive ALARM conditions leading up to the shutdown ERROR.

EXAMPLE: The flame electrode is fouled. This prevents the burner from having a flame signal. ALARM code 146 (Flame Not Established) is displayed and the status light flashes. While this is occurring, the burner is automatically restarting itself (three times maximum) attempting to light. The burner shuts itself down on ERROR code 144 (Excessive Flame Failures) after 3 unsuccessful tries. The display continues to show ALARM code 146 although the status light is still flashing and the burner is shut down due to an ERROR. Press SELECT to clear each ALARM code and then to clear ERROR code 144. After ERROR code 144 is cleared, the operator can attempt to restart the burner.

Note: Errors that have an * in front of them can be temporarily bypassed. See the bypass routine explanation at the end of this section for more details.

ERROR 101

BLOWER MOTOR OVERLOAD: This ERROR means that the overload relay for the blower motor starter MOL is tripped. The following should be checked before continuing operation with this error:

- Verify setting of overload relay MOL at 4.5 amperes.
- Verify voltage as 380VAC, 415VAC or 480VAC. Check for low voltage condition.
- Verify free rotation of blower and motor.
- Verify that blower speed is not faster than 2170 RPM.

*** ERROR 120**

RESTART NOT PERMITTED BECAUSE AIR FLOW SWITCH HAS NOT BEEN OFF IN 24 HOURS: The Air Flow Switch (AFS) must be exercised periodically to insure its proper operation. If the burner and blower have run continuously for over 24 hours, the burner will **NOT** shut down due to this ERROR, however if the burner is turned off and an attempt is made to restart it without turning off the blower (see note below), it will not start and will display ERROR 120. The SELECT button will **NOT** allow restart. The blower must be turned off and then back on to allow the burner to start again. If the operator is aware of the safety reasons for this air flow switch check and desires to not turn the fan off, a passcode to bypass this ERROR is described in the footnote for this section.

Note: For most HG-1 heater installations, the blower is an integral part of the heater system so this ERROR will not occur unless the air flow switch (AFS) is out of adjustment.

ALARM 121

AIR FLOW WENT OFF FOR A MOMENT: This ALARM is an indication that a choke of the air flow is occurring. It is displayed when the Air Flow Switch goes off and comes back on in less than 3 seconds. The Air Flow Switch (AFS) may be set too sensitive.

ERROR 122

AIR FLOW WENT OFF FOR MORE THAN 3 SECONDS: This ERROR occurs when the air flow is interrupted for more than 3 seconds. Verify proper air flow and adjust Air Flow Switch if necessary.

ERROR 125

GAS LOW PRESSURE: The gas pressure is constantly monitored by the gas low pressure switch (GLPS) in the lower cabinet. This ERROR is triggered when the pressure is below 1.5 PSI when the gas valves are open. Check for a closed gas cock or ball valve in the gas line to the heater. For propane systems, check for malfunction of vaporizer. The GLPS is set to 45 inches water column (about 1.5 PSI).

In rare cases, the screen on the inlet to the SSOV valve block may be clogged. Refer to the *TESTS EXPLANATION* section for *GAS LOW PRESSURE* for a picture of the location of this screen.

ERROR 126

GAS HIGH PRESSURE: The gas pressure is constantly monitored by the gas high pressure switch (GHPS) in the lower cabinet. This ERROR is triggered when the

pressure is above 4.5 PSI. Check for malfunction of the gas pressure regulator (GPR). The GHPS is set to 120 inches water column (about 4.5 PSI).

* **ERROR 130**

GAS LOW PRESSURE SWITCH FAILED TO OPEN: The gas low pressure switch is not responding as it should in normal operation. The PLC performs an automatic check of the heater's switches and safety devices each time the burner is started. One of these checks is the Gas Low Pressure Switch (GLPS). If this switch is closed when it should be open, the PLC will not permit the burner to start.

Possible causes of this abnormal operation of GLPS are:

- (1) SSOV1 is malfunctioning and is open, maintaining gas pressure on GLPS at all times.
- (2) the GLPS switch is out of adjustment. GLPS should close above 1.5 PSI.
- (3) GLPS has been tampered with or bypassed electrically.
- (4) Excessively high static pressure within the combustion chamber.
- (5) The low fire gas valve is closed off too far to allow gas to bleed off when gas is evacuated from the gas train by the Pilot Valve (PV) during the startup tests.

If the operator is aware of the safety issues involved in bypassing the function of this switch, a software bypass is available for emergency operation. The passcode for this bypass is described in the footnote for this section.

To check GLPS, run the TESTS program step for Gas Low Pressure and then turn the local +/- selector switch to "-". This opens the Pilot Valve (PV). This evacuates the gas pressure cavity in the gas train and the gas pressure gauge should read 0 PSI.

ERROR 131

USER SPECIFIED TIME FOR SHUTDOWN: Some countries require that gas-fired combustion products turn off once every 24 hours as a safety measure. To accommodate operators that need to comply with this regulation, ERROR 131 will force the heater to shut down once a day at a user defined time. This error will only occur if the 24 Hour Shutdown routine is enabled in the SETUP program. This error can be disabled in the SETUP program. See the *SETUP EXPLANATION* section for more information.

ERROR 134

CHECK GAS SUPPLY AND OPERATION OF SSOV1: Gas pressure is tested when the heater is started. ERROR 134 occurs when the GLPS switch does not close with this gas pressure. Possible causes are low gas pressure, a defective SSOV1 valve actuator that prevents gas from reaching the GLPS switch, or a maladjusted GLPS switch. If upstream gas pressure gauges indicate that gas pressure is sufficient (6 PSI before the regulator should be minimum), suspect the SSOV1 valve actuator. GLPS switches are normally not a problem and should not be adjusted unless suggested by the factory.

ERROR 136

GAS VALVE LEAK, UPSTREAM: This is a serious ERROR caused by a leak in the SSOV1 valve. This is the "upstream" gas valve. The test program may be run to determine the severity of the leak. See the TESTS program for Gas Low Pressure. A leak in the first SSOV valve is usually caused by dirt or other contaminants on the rubber seat of the valve. Contact the factory for technical assistance if required.

ERROR 137

GAS VALVE LEAK, DOWNSTREAM: This ERROR is caused by a leak in either the pilot valve (PV) or the SSOV2 valve. These are both "downstream" gas valves. The test program may be run to determine the severity of the leak. See the Gas Low Pressure TESTS for details. Contact the factory for technical assistance.

ERROR 140

RESTART NOT PERMITTED. NO LEAK TEST PERFORMED FOR PAST SIX SHUTDOWNS: Automatic gas leak testing has been interrupted for the past 6 shutdowns. Each time the burner is turned off, the PLC attempts to spend about 10 minutes performing an automatic leak check on the gas valve assembly. These tests can be interrupted by simply turning off the power or restarting the burner before the 10 minutes has ended. The PLC demands that a leak test be performed at least once every 7 shutdowns. If each of the past 6 shutdowns have had the leak test interrupted, the PLC will not start until the SELECT button is pressed to clear ERROR 140.

ERROR 142

AIR FLOW SWITCH IS ON WITHOUT BLOWER ON: This error indicates that an electrical signal is being received from the air flow switch with the blower off 10 minutes after burner shutdown, effectively bypassing this important safety feature. Check the adjustment of the Air Flow Switch (AFS) and verify its operation.

ERROR 144

EXCESSIVE FLAME FAILURES: While the burner is operating, it counts the number of times the flame fails (either igniting or while running). When the total comes to 3, it shuts the burner down on ERROR 144. If either of the ALARM codes 146 or 151 are shown for this, it means that the first failure is the one displayed (i.e.: "Flam Not Established" might mean the spark plug needs to be cleaned). Press SELECT as required to clear all ALARMS and this ERROR.

ALARM 146

FLAME NOT ESTABLISHED: This ALARM means that the burner failed to light. It is an indication that there may be air in the gas line, insufficient low fire gas, or turbulent air flow. If the burner is being operated above a push fan, air turbulence can prevent the burner from lighting. Verify that the shutters installed between the fan and burner head are not closed down too far. Gas pressure may be increased to provide more low fire gas to the burner heads if required. See the following maintenance tips.

ALARM 151

BURNER FAILED IN OPERATION: This ALARM means that the burner failed while burning. See the following maintenance tips.



TIPS

THE FOLLOWING MAINTENANCE TIPS WILL HELP TO MINIMIZE FLAME FAILURE ALARMS:

- Check that the burner head is positioned correctly inside burner body. Refer to *TESTS EXPLANATION* in this manual under the *PRELIMINARY* section for details.
- Clean the spark plug if it appears fouled.
- Scrape off the flame electrode and wipe the ceramic insulator with a clean cloth.
- Increase the gas pressure if low fire setting appears to be extinguished from air turbulence.
- Increase the gas low fire valve opening a little.
- Check for a grounded ignition circuit.
- Check burner orifice alignment. See *BURNER ORIFICE ALIGNMENT* page in this manual.

ERROR 153

FLAME SIGNAL BEFORE FUEL AND SPARK: This ERROR means a flame signal is observed before spark and fuel are supplied to the burner head. This ERROR is normally caused by a malfunction or tampering with the Flame Relay (FLR). In some cases, a loose nut or bolt from overhead piping has fallen into the burner head assembly forming a short circuit between the flame electrode and the burner head. If the Flame Relay appears to be good, check for a loose metallic object in the burner head assembly. Also check for carbon build-up in the burner head causing a short to the flame rod.

ERROR 155

FLAME SIGNAL BEFORE FUEL DURING SPARK: This ERROR is caused by electrical interference between the spark plug wire and the flame electrode wire. Run these wires in separate conduits. As the spark plug wire carries in excess of 12,000 volts, make sure that it is routed along the **BOTTOM** of the control cabinet. A spark plug wire routed incorrectly in the control cabinet can interfere with the operation of the PLC and other electronic components.

ERROR 164

AIR TEMPERATURE THERMOCOUPLE BURNOUT: This ERROR normally means that the thermocouple mounted in the duct sensing air temperature has burned out or the thermocouple sensor wire connections are loose. If the air temperature remains at 000 F a few seconds after the heater lights, this ERROR occurs. The thermocouple wires are polarity sensitive so reversing the wire hookups could also cause this condition. For type 'J' thermocouples, the white wire is positive, red is negative. Reversing the wires will cause the PLC to think the temperature is falling when it is actually rising. If the temperature is dropping as the gas valve is opening, this ERROR will occur.

***ERROR 166**

SSOV1 FAILED POC SWITCH NOT SATISFIED: The PLC was not able to verify that Safety Shut-Off Valve 1 (upstream SSOV valve) is opening and closing in a timely manner. If this problem persists, try the following: Check that SSOV1 opens and closes. Check for gas leaks. Check operation of SSOV1's Proof of Closure switch (POC). Replace SSOV1 valve actuator and/or its proof of closure switch.

If the operator is aware of the safety issues involved in bypassing the function of the Proof of Closure switch (POC), a temporary software bypass is available by pressing the BYPASS button on the error screen.

ALERT 170

LOW PLC BATTERY: This ALERT means that the PLC battery needs to be replaced soon. A dead PLC battery will prevent the display from working (except to display E042 NO CPU BATT) and the ERROR LOGGING SYSTEM will lose the log history. The burner can continue to operate with a dead battery. ALERTS are not entered into the error logging system.

ERROR 171

HIGH TEMPERATURE DOWNSTREAM: This ERROR will shut the burner down if the heated air temperature is more than 50 degrees above the air temperature setpoint.

ALARM 172

FLAME CONTINUES TOO LONG AFTER SHUTDOWN: This ALARM means that flame is detected for more than 12 seconds following closure of all gas valves. This indicates a probable gas leak in the system. Run the TESTS program and perform the Gas Low Pressure test to determine the severity of the leak. Consult the factory for service recommendations. In rare cases, very low quality LPG fuel can cause this.

ERROR 174

CONSTANT AIR TEMPERATURE > 60 SECONDS: The heated air temperature is constantly monitored. Very small fluctuations in temperature are expected and indicate that the thermocouple wiring and thermocouple input card on the PLC are in working order. Check for disconnected thermocouple, thermocouple wiring problem and connections to the thermocouple input card on the PLC.

ERROR 177

POWER FAULT DURING OPERATION: This ERROR means that electrical power was disconnected while the burner was on. Check for faulty supply wiring connections.

* Indicates an ERROR condition that can be temporarily bypassed.

These steps will have to be performed in order to bypass the ERROR each time the heater is started until the condition is fixed. Some problems will require the bypass of multiple errors before operation can occur.

Before the SELECT button is pressed to clear the ERROR, do the following:

- Use the START/STOP switch at the LOCAL PANEL in the heater. Turn it to the left (O) 3 times.

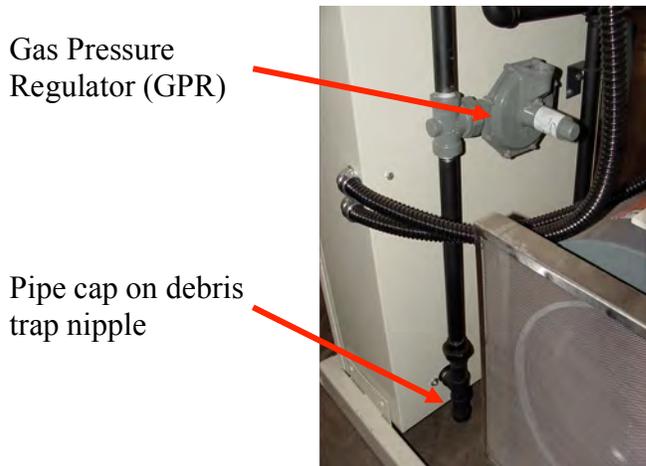
- Press the SELECT button to clear the ERROR and attempt to restart the heater.

TESTS EXPLANATION

PRELIMINARY

To test a new installation, first check that all necessary connections for electrical, and gas are made. Standard 3-phase electrical power supplies are 480VAC 60 HZ, 415VAC 50 HZ, or 380VAC 50 HZ.

With electrical power off, prepare to purge the gas line of debris and air by closing off the gas supply valve before the Gas Pressure Regulator (GPR) and having the main gas supply on. Open the pipe cap on the end of the short pipe debris trap nipple under the regulator and quickly open/close the gas supply valve several times. Debris in the pipe will blast out. Keep doing this until gas is noticeable and debris has cleared. Make sure good ventilation is present and no one is smoking.



Note optimal position of flame rod inside body for optimal ignition and operation.

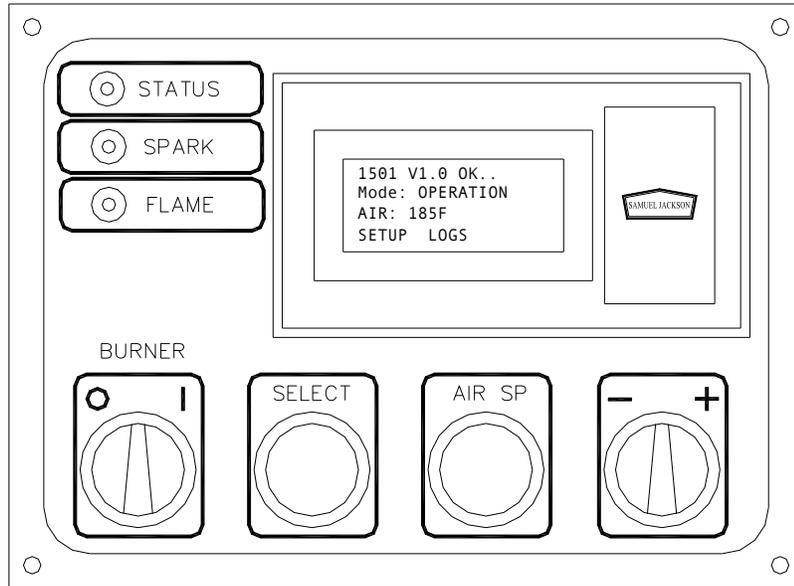


Check installation of moist air thermocouple and that burner head is rotated so flame rod is on side of burner body as shown in picture above. Apply power by turning on disconnect. Check that power on terminals 1 and 3 on the electrical panel is between 110 and 120 VAC. If the single phase voltage is not within this range, check that the correct secondary tap connections are made on Control Voltage Transformer CT referring to the *ELECTRICAL SCHEMATIC Drawing No. CA13461* shown in this manual. Call the factory for assistance.

TO ENTER TESTS PROGRAM

The TESTS program is run from the Diagnostic Module Display DMD at the Local Panel LP. TESTS is used at the factory on the test stand, used at commissioning time, and used to help troubleshoot the heater in the future. TESTS can only be accessed when the heater is off and not during the heater's normal gas leak test. To access TESTS when the heater is doing its leak test, power cycle the panel.

To enter TESTS, turn the +/- selector switch until the blinking cursor is on TESTS. Press the SELECT button to enter TESTS. Use the +/- selector switch to maneuver through the various test selections. Press the SELECT button to choose the test you want to perform.



Unlike earlier Samuel Jackson combustion products with PLC's where the test program had to be done in sequence, this TESTS program allows the user the choice of which tests to perform. Observe the display for test program prompts.

TO EXIT TESTS PROGRAM

To exit TESTS at any time, turn the +/- switch until BACK is displayed, then press the SELECT button. Killing the supply power will also exit the test program.

Following are the TESTS selections that are available with descriptions of each.

BACK -- Pressing SELECT button when BACK is displayed exits the TESTS program.

INPUTS -- Observe the condition of PLC inputs. The alphanumeric displays ON and OFF status of inputs. If input status is not correct, the input number will flash on the displays until corrected. The operation of the local start-stop switches (and optional remote start-stop switches) and other inputs can be tested while observing the displays or the input LED indicators on the PLC. Press SELECT to proceed. If inputs are not correct, advancing out of this test will be prohibited. If the problem is understood and bypass is desired, press and hold SELECT button for 3 seconds to advance. If input 6 (X106 for Gas Low Pressure switch GLPS) is blinking, turn the +/- switch to - momentarily to open Pilot Valve (PV) to relieve the gas pressure.

AIR FLOW SWITCH -- The blower will turn on for this test. Before proceeding, check that the rotation of the blower is correct.



If the rotation is wrong, disconnect 3 phase power to the Heater following OSHA lockout/tag-out procedures before proceeding.

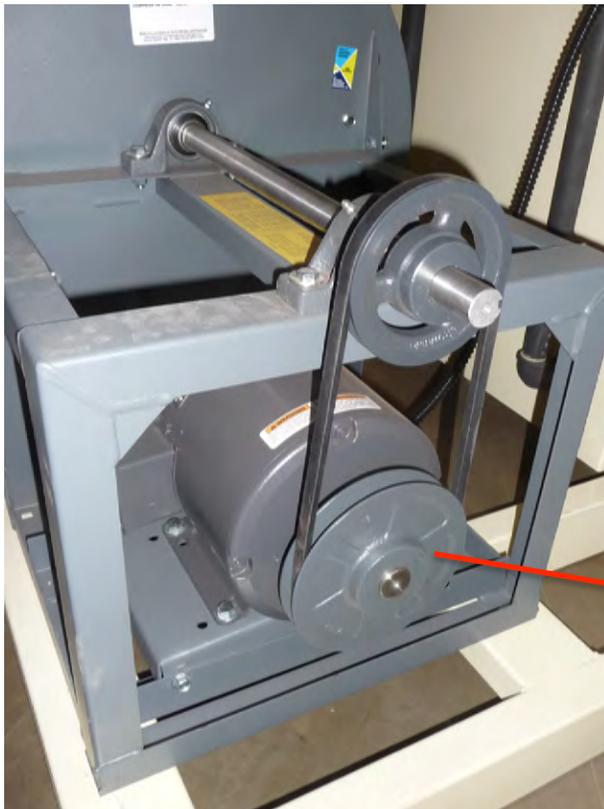
Swapping the positions of two of the 3Ø wires at the supply side of the motor contactor (MC) will reverse the blower motor. After checking the wires a final time for tightness, reconnect the power.

A variable pitch sheave on the blower motor can be adjusted to fine tune the air output of the blower. The maximum blower RPM for the 3 HP motor is 2150 +/- 20 RPM. The pulley comes from the factory set for maximum blower speed. It may be necessary to slow the blower down for lower airflow applications. The blower will deliver between 750 and 3000 CFM of air depending on the blower's speed and the total resistance to air flow for the duct system.



TIPS

It is better to change the speed of the blower to get close to the desired air volume than severely gating down the air flow from an over sped blower.



Variable pitch sheave on motor.

Drive guard removed for illustration – do not operate without guard in place.

After the air volume is set for the application, the velocity pressure VP through the burner head should be between 0.3 and 0.6 inches water column (1.0 cm). The VP can be checked by disconnecting the two air flow tubes from the Air Flow Switch and connecting them to a Magnehelic gage using rubber tubes.

White tube is upstream pressure so connect to “high” pressure port on gage.

Black tube is downstream pressure so connect to “low” pressure port on gage.



If necessary, adjust the velocity by adjusting the vanes that constrict the passage of air just ahead of the burner head. Disconnect power to the Heater before proceeding to adjust the vanes. The vanes are just inside the burner access door. Bring the vanes closer together to increase VP or farther apart to reduce it. Make the adjustment the same on all vanes. These vanes are not installed at the factory and can be found in the lower cabinet for use in lower airflow situations. Do not install the vanes unless the heater will be operated on a low volume of air.

If VP is too low, the flame might be yellowish, and the air flow switch not so responsive. If VP is too high, the flame will burn with a roar at high outputs or may be difficult to ignite.

Adjust vanes evenly



Burner body access door shown removed allowing access to the air vanes.

Once the VP is within the desirable range, adjust the Air Flow Switch AFS. See picture below for instructions.

Observe Input No. X5 on PLC for on/off condition of Air Flow Switch.



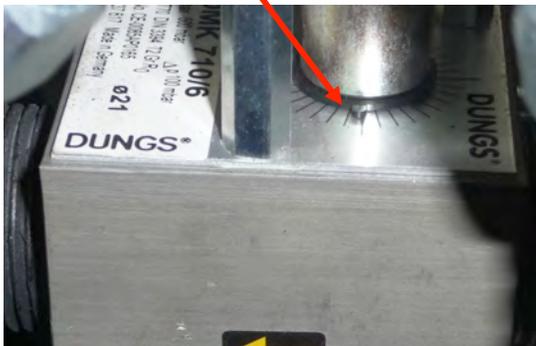
Adjust this screw in (clockwise) until Input No. X5 on PLC goes off. Slowly start backing screw out until input 5 comes on then continue to back screw out $\frac{1}{2}$ more round.

GAS ACTUATOR – The blower is on for this test. The actuator motor of the modulating temperature control valve GVM is powered up. Turn selector to “+” to drive the motor to the open position. Turn selector to “-“ position to drive the valve to the closed position. This test checks the integrity of the 4-20mA DC control signal going from the PLC to the valve and checks the operation of the valve. The AIR SP (set point temperature) needs to be adjusted to at least 150F for this test to work well since the PLC will generate a full 20mA signal for full valve travel at higher set points.

The Gas Valve Motor (GVM) has been adjusted at the factory for correct travel. If replacement of GVM is necessary in the future, refer to the picture below for the adjustment of the three color coded rings under the cover of the motor.

Rotate the three color rings so the tabs are in the positions shown here

Tip indicates butterfly position in valve. Position shown is closed (0%).

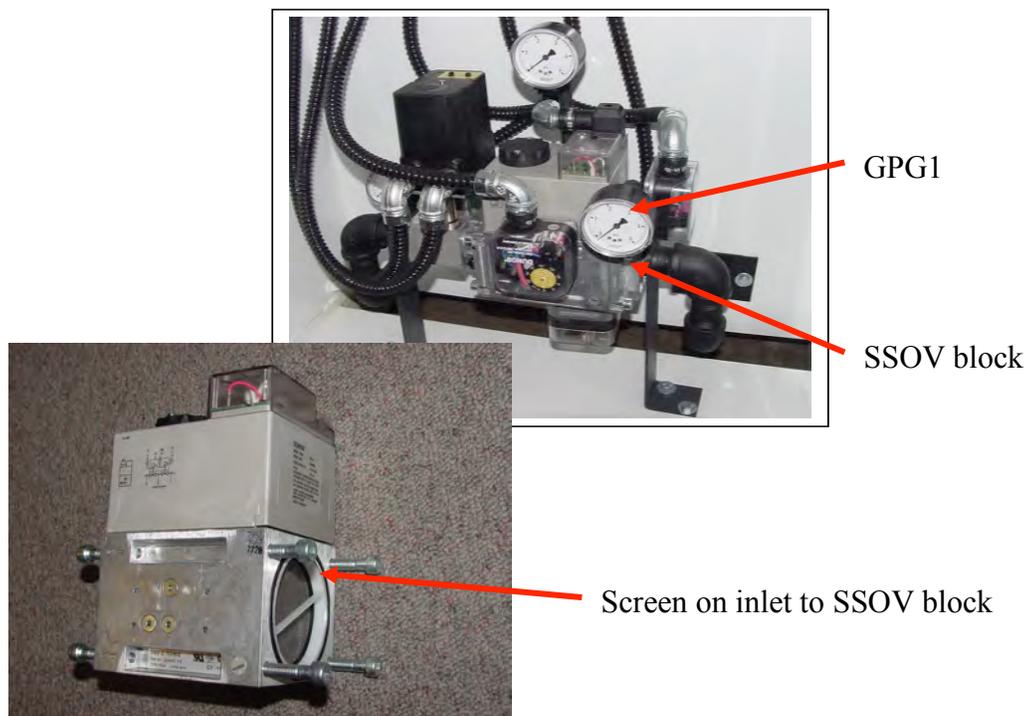


GVM Gas Valve Motor adjustment

GAS LOW PRESSURE -- The blower is on for this step. The +/- switch is now used to test for presence of gas, adjust its pressure, test for valve leakage and adjust the gas low pressure switch, if necessary. The “+” position opens the Safety Shutoff Valve SSOV1, admitting gas pressure to the cavity. The display will show that the gas cavity is “CHARGED” when the pressure is above 1.5 PSI in the gas train registered by the Gas Low Pressure Switch GLPS. “NOT CHARGED” will be shown if pressure is less than 1.5 PSI. The final pressure should be between 2.5 and 3 PSI when the heater is operating.

With the gas cavity charged, leave the valves closed several minutes to see that the pressure does not leak off. This tells us that the downstream valves, Pilot Valve PV and Safety Shutoff Valve SSOV2, are not leaking. Turn the +/- selector to “-” to energize PV. This will evacuate the gas cavity. Leave the valves closed several minutes to see that the pressure does not build up. This tells us that the upstream valve, SSOV1, is not leaking. The operating program will perform similar tests every time the heater is shut down. This is one reason electrical power must be supplied to the heater continuously, or at least for 10 minutes after each shutdown.

In rare cases, the screen on the inlet to the SSOV block may become clogged with debris from the gas supply. Evidence of this will be gas low pressure errors and a loss of heat output while the pressure shown on Gas Pressure Gage 1 (GPG1) is normal of about 3 PSI. The GPG1 pressure tap is upstream of the screen. To clean the screen, it is necessary to remove the valve block from the flanged inlet and outlet pipe fittings. The pilot valve (PV) line behind the SSOV block will have to be disconnected to remove the SSOV block. Contact the factory for technical assistance.

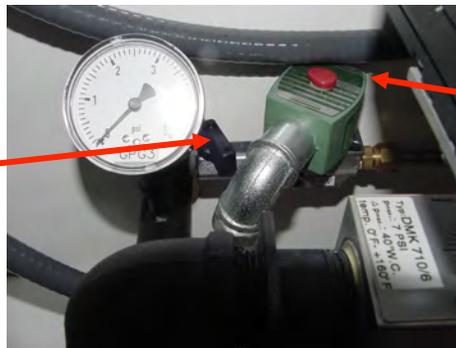


IGT TRANSFORMER -- The +/- switch is now used to test the Ignition Transformer IGT. The blower will turn on when this test is entered and it must run 20 seconds to purge the duct system with air before this test can proceed. After the 20 seconds, turning the +/- switch to “+” turns on the Ignition Transformer IGT. If the gin is quiet, you can hear the spark. If there is difficulty, check the spark plug electrode gap at 1/16 to 1/8" (1.5 to 3 mm). Hold the IGT on for two seconds while observing the flame light on the local panel LP. If the flame light turns on, it means that there is electrical interference between the spark plug wire and the flame electrode wire. They should be run to the burner in separate conduits to avoid such interference. Since the operating program makes a similar test before each ignition, the burner will not operate until this problem is corrected. INTERFERENCE will flash on the display if electrical interference occurs.

TRY IGNITE -- The blower will run for 20 seconds before the burner attempts to ignite. After the 20 seconds, trial for ignition occurs and only lasts 10 seconds. During this time, adjust the gas low fire valve (shown on the picture below). Start with it closed, and slowly open it until the burner ignites. Adjust it for the lowest flame possible, yet high enough for dependable ignition. The burner should now operate normally, with GVM free to modulate the flame up to high output. Make sure that the temperature is responding correctly. The burner will automatically shut down after 10 minutes or when STOP is operated, air flow fails, or on flame failure.

If flame fails during startup, crack the gas low fire valve open a little more and try the test again.

Gas low fire valve is fully closed when handle is cross ways to pipe.



Gas Pilot Valve (PV)

To exit the test program, kill power or press SELECT and turn the +/- switch to BACK. Press SELECT button once. The STATUS light should stop blinking. To operate the burner normally, operate the START-STOP (O - I).

SETUP EXPLANATION

The SETUP program allows the user to make adjustments to the time and date, maximum and minimum air temperatures and other variables that may need to be adjusted to match the heater to the system. These adjustments can be made while the heater is on or off.

TO ENTER SETUP PROGRAM -- The SETUP program is run from the Diagnostic Module Display (DMD) at the local panel. To enter SETUP, turn the +/- selector switch until the blinking cursor is on SETUP. Press the SELECT button to enter SETUP. Use the +/- selector switch to maneuver through the various setup selections. Press the SELECT button to choose the variable you want to change. Follow the prompts on the screen and use the +/- selector switch to adjust the variable.

Following are the SETUP selections.

BACK -- Exits the SETUP program.

24 HR SHUTDOWN -- This step is used to enable or disable the automatic 24-hour shutdown. If this feature is enabled, everyday at a user defined time the Heater will automatically shutdown and ERROR 131 will be displayed. To prevent the automatic shutdown, this feature should be disabled.

To enable this feature, turn the +/- selector switch to “+” for YES. To disable this feature, turn the switch to “-”. Once the desired option is selected, press the SELECT button to continue. If the “disable” option has been chosen, the test program will advance back to the 24 HR SHUTDOWN prompt. If the “enable” option is chosen, a prompt will appear which allows you to set the time you want the Heater to automatically shutdown. Once the shutdown time has been set, press SELECT.

CHANGE TIME/DATE -- Time and date are confirmed or changed in this step. Time and date are used in the logging of errors and alarms within the PLC. If the time and date are correct, press SELECT to proceed. If an adjustment is needed, turn the +/- selector switch to the left (-) momentarily. The confirmation will change to “NO” and the SELECT button will advance through all time and date variables. At each position, use the +/- selector to change the value appropriately to obtain the correct time and date. When finished, confirm the new time and date by pressing SELECT to proceed.

BATTERY STATUS -- The PLC’s battery status will be displayed. If battery power is lost, retention of the heater’s error history will be lost along with custom settings and variables. The operating program is stored in nonvolatile memory so fundamental operation of the burner will never be jeopardized by the loss of battery power. The battery may be replaced at any time, even during the heater’s operation, without adversely affecting the system. Press SELECT to proceed.

SET MAX AIR SP – The maximum air temperature set point (SP) the user can adjust the control to is set in this step. The factory default is 300 degrees F. The adjustable range is from 100 to 485 degrees F.

SET MIN AIR SP – The minimum air temperature set point (SP) the user can adjust the control to is set in this step. The factory default is 100 degrees F. The adjustable range is from 100 to 200 degrees F.

MIN GAS POSITION – About one minute after flame is established, the Pilot Valve PV is closed. Some gas must flow through the main butterfly valve even at low fire to maintain a flame. The minimum gas valve position is set here. A setting of 10% is normal for most applications.

PID SETUP GAIN -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set GAIN to 075.

PID SETUP RESET -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set RESET to 122.

PID SETUP RATE -- The temperature control system has been pre-tuned at the factory for best operation of the heater in most situations. If the tuning has been corrupted or changed and a return to the original factory setting is desired, set RATE to 020.

BURNER ORIFICE ALIGNMENT

If you are experiencing excessive flame failures or difficulty establishing flame, check to make sure the orifice in your burner head is aligned correctly to the flame rod. Proper orifice alignment will also reduce the formation of soot and carbon on the flame rod especially when using propane or butane fuels.

The picture below shows the correct alignment of the orifice disk. The contoured stainless steel disk has been removed for illustration. Note that one of the orifice slots is pointed directly toward the spark plug.

Point one slot directly
to spark plug



To adjust the orifice alignment, remove the contoured disk from the burner body by removing the 3/8 inch stainless steel cap screw. Rotate the orifice disk so that one of the slots is pointed directly at the spark plug. Insert a small screwdriver through the hole in the burner shell and into a slot in the orifice. Reinstall the contoured disk while using the screwdriver to keep the orifice from rotating.

After reinstalling the burner assembly, the flame rod should glow red hot while the flame is on improving ignition, reducing flame failures and reducing formation of soot and carbon on the flame rod.

STUB-UPS

<u>NO.</u>	<u>DESCRIPTION</u>	<u>ROUTING AND NOTES</u>
1	BURNER POWER	<p>FROM ELECTRICAL SERVICE TO HEATER. 380VAC-480VAC, 50/60 HZ, 3 HP, ¾ CONDUIT, 3-12 GA WIRES.</p> <p>FAN MOTOR STARTER AND 120V CONTROL TRANSFORMER ARE IN HEATER CABINET.</p>
2	DUCT THERMOCOUPLE (MARKED BLUE)	<p>FROM BURNER CABINET TO: LOCATE IN HOT AIR DUCT AT LEAST 10 FEET FROM BURNER OUTLET.</p> <p>1/2" CONDUIT WITH 1 PAIR SHIELDED CABLE. * DO NOT RUN WITH AC VOLTAGE WIRES. OKAY TO RUN WITH OTHER THERMOCOUPLE OR DC VOLTAGE WIRES. SEE <i>THERMOCOUPLE WIRING</i> SECTION FOR MORE DETAILS.</p>
3	BURNER SPARK PLUG WIRE IN ONE CONDUIT & IN SEPARATE CONDUIT BURNER FLAME ROD WIRE WITH GROUND WIRE	<p>FROM BURNER CABINET TO THE BURNER BODY. CONDUITS AND WIRE SUPPLIED WITH HEATER. RUN WITH ONE ¼ INCH PLASTIC AIR FLOW TUBE IN EACH CONDUIT. TUBES SUPPLIED WITH HEATER.</p>
4	<p>OPTIONAL HEATER CONTROL AC WIRES TO REMOTE LOCATION. FOR REMOTE START/STOP AND FLAME INDICATION.</p> <p>ELECTRICIAN TO SUPPLY OPTIONAL SWITCHES AND LIGHT FOR 120VAC</p>	<p>HEATER CABINET TO CONSOLE ½" CONDUIT, 5-16 GA WIRES.</p>
5	GAS SUPPLY FOR BURNER	<p>1" GAS SUPPLY LINE. NATURAL GAS OR PROPANE. 6 TO 20 PSI, 0.4 TO 1.7 BARS. SEE <i>DRAWING 14-1899</i> IN MANUAL FOR NOMINAL RECOMMENDED PIPE SIZES.</p>

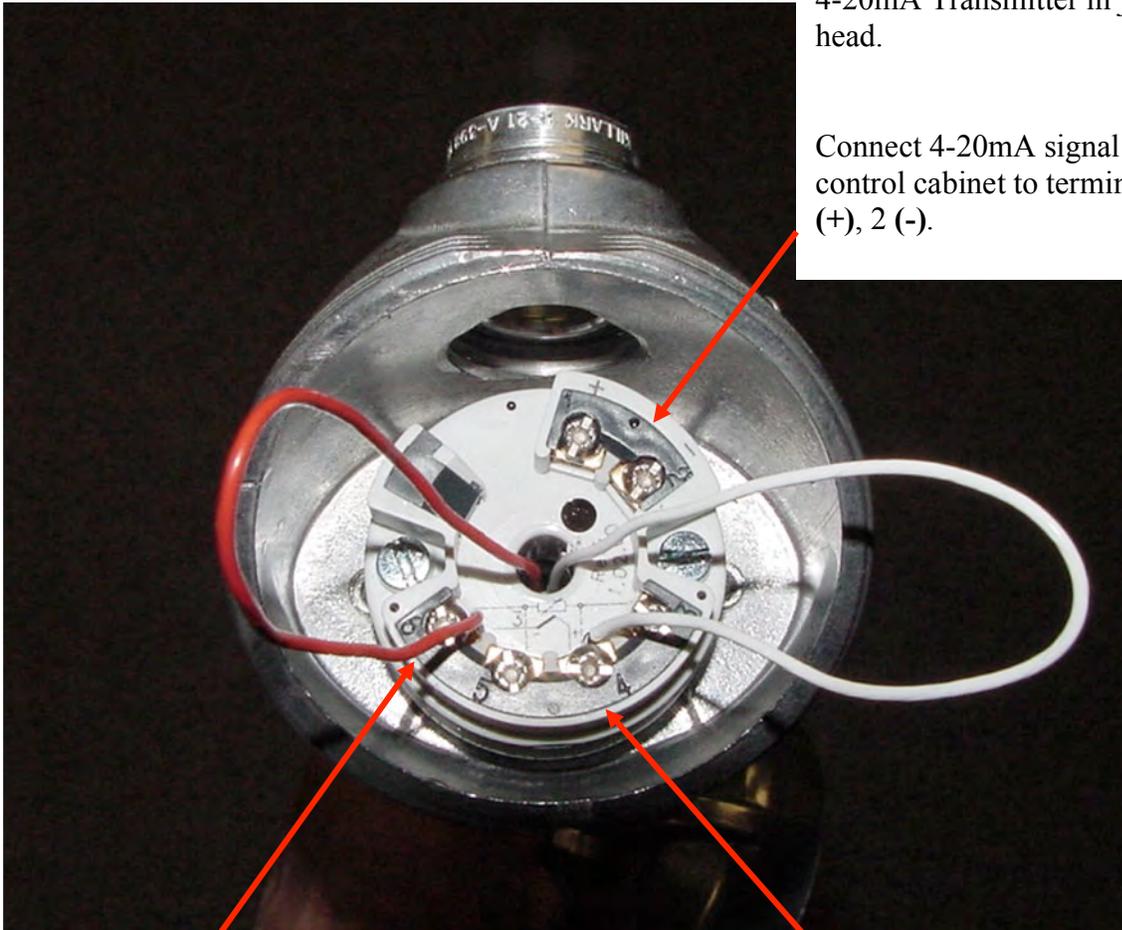
THERMOCOUPLE WIRING

The following rules need to be followed when wiring the thermocouple temperature sensors from the Thermocouple to the Heater electrical panel. The signal from the temperature sensor is 4-20mA DC.

- **Always** use shielded, 2 conductor cable from the thermocouple to the control panel terminal blocks. Terminate the shield only on the electrical panel end. Do not use Type J thermocouple wire for hookup.
- **Never** run the shielded sensor wires with the power wiring (including 120 VAC control wires). You can run several shielded 4-20mA shielded wires together in the same conduit with other wires marked sensitive on the external connection diagram.

Part No. 21708 Type 'J'
Thermocouple shown with
4-20mA Transmitter in junction
head.

Connect 4-20mA signal wires to
control cabinet to terminals 1
(+), 2 (-).

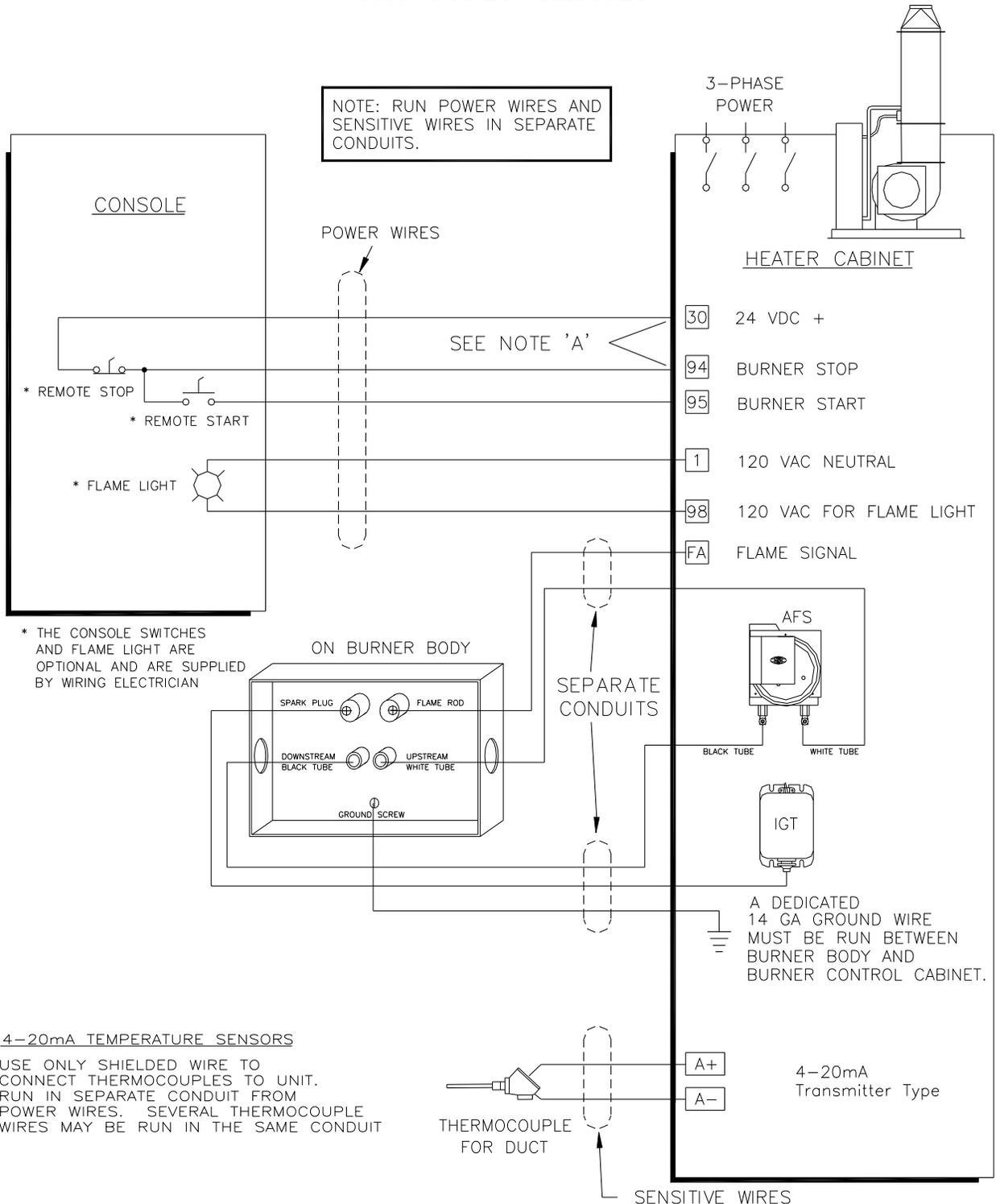


Red (-) wire from Thermocouple
junction goes to terminal 6.

White (+) goes from Thermocouple
junction goes to terminal 4.

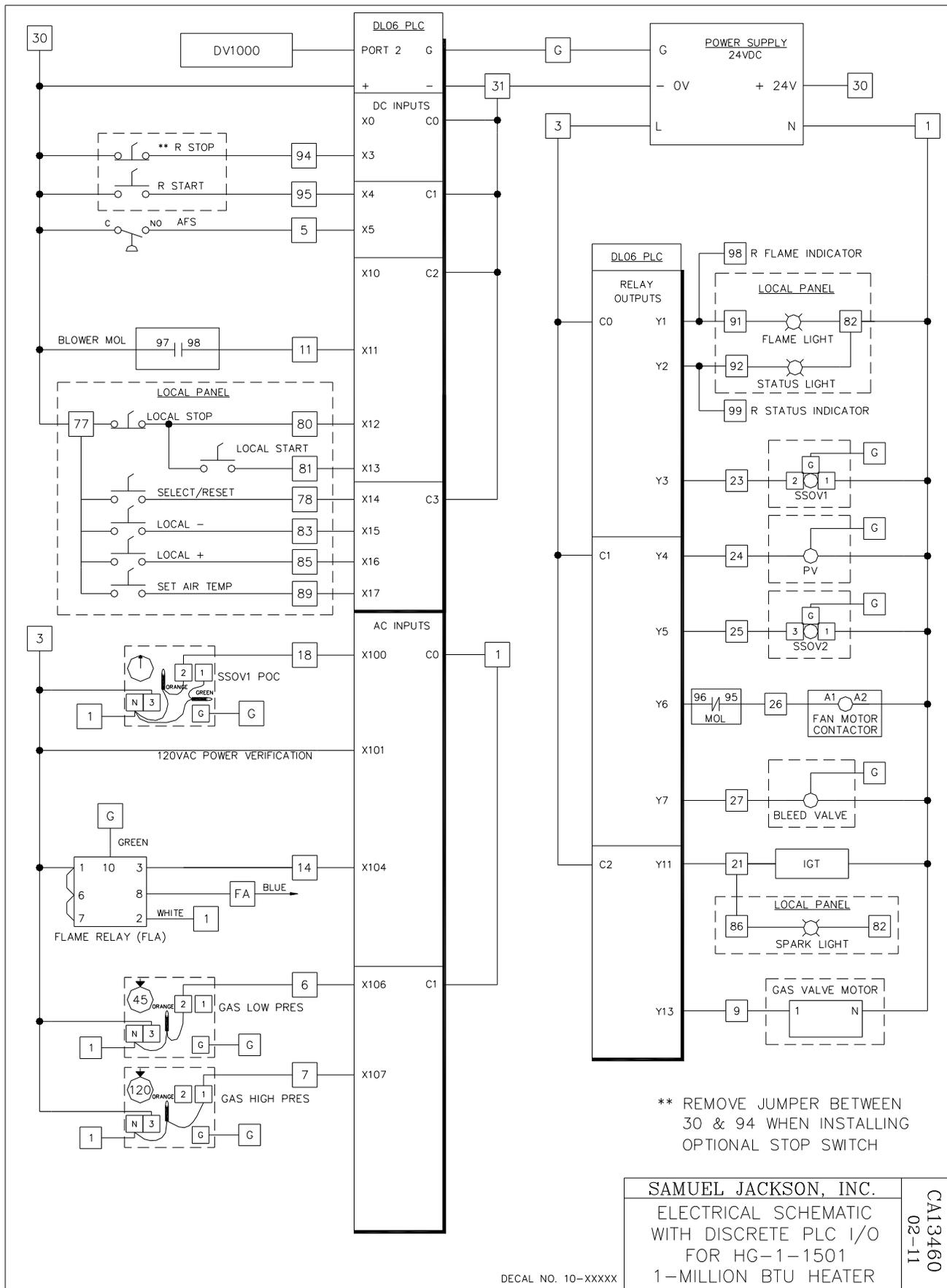
EXTERNAL ELECTRICAL CONNECTIONS HG-1-1501 GAS FIRED HEATER

CA13442A
7-11



4-20mA TEMPERATURE SENSORS
USE ONLY SHIELDED WIRE TO CONNECT THERMOCOUPLES TO UNIT. RUN IN SEPARATE CONDUIT FROM POWER WIRES. SEVERAL THERMOCOUPLE WIRES MAY BE RUN IN THE SAME CONDUIT

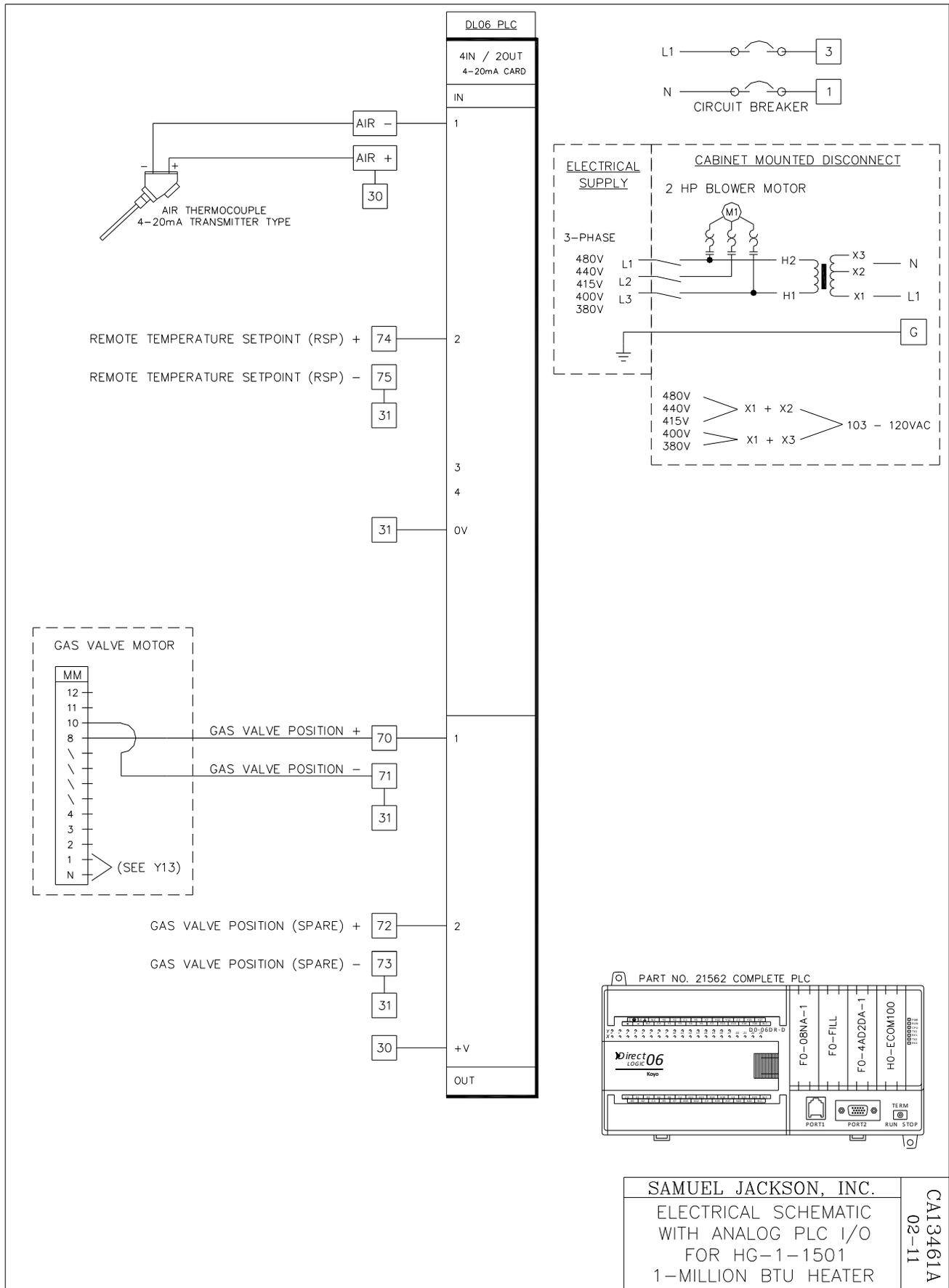
NOTE 'A': IF A REMOTE START-STOP SWITCH IS INSTALLED, THE FACTORY INSTALLED JUMPER BETWEEN TERMINALS 30 AND 94 MUST BE REMOVED.



SAMUEL JACKSON, INC.
 ELECTRICAL SCHEMATIC
 WITH DISCRETE PLC I/O
 FOR HG-1-1501
 1-MILLION BTU HEATER

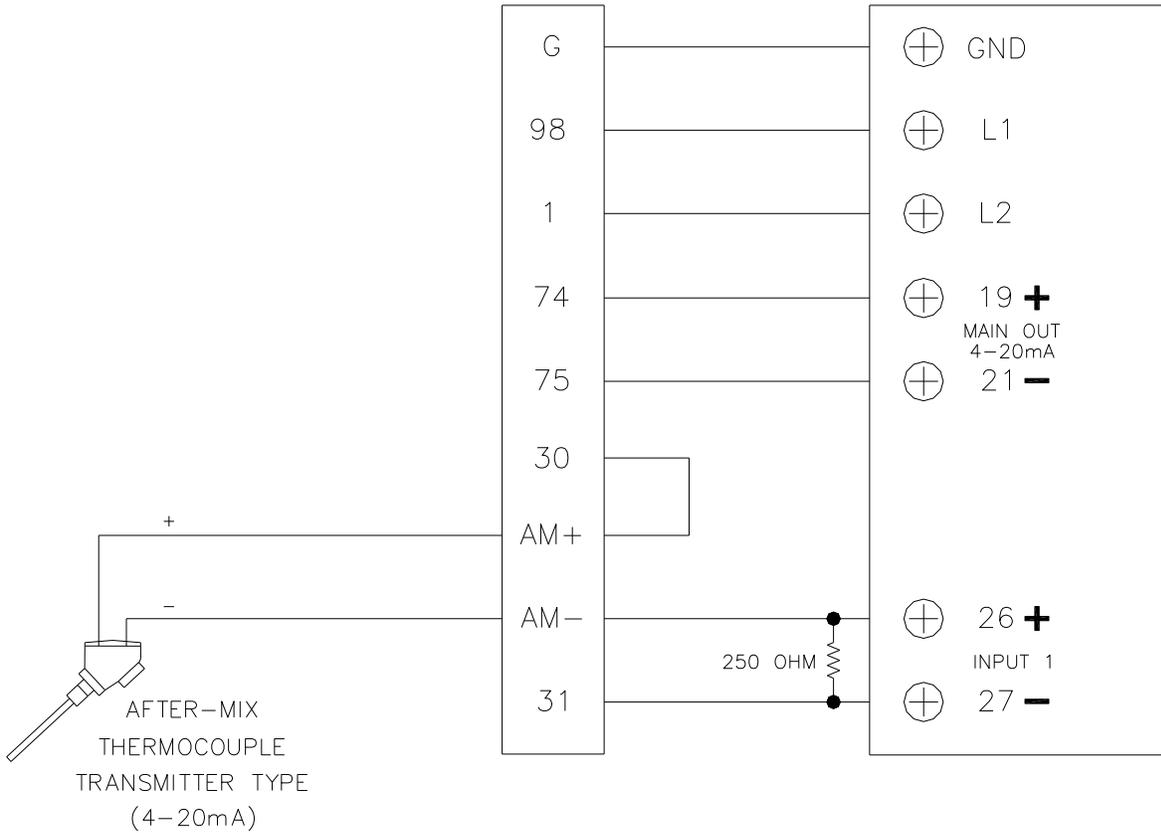
CA13460
02-11

DECAL NO. 10-XXXX



HG-1-1501
TERMINAL NUMBERS

UDC 2500



THIS SCHEMATIC SHOWS TRANSMITTER TYPE THERMOCOUPLE.
SEE 1501AM.TUN FOR UDC PROGRAMMING.

SAMUEL JACKSON, INC.
OPTIONAL
AFTER-MIX CONTROL
WIRING FOR HG-1-1501
GAS-FIRED HEATER

CA13462
11-11

GAS PIPING

The size of the pipe supplying gas to heaters and other appliances should be large enough to prevent excessive pressure losses when all of them are in use. See following Table of *RECOMMENDED MINIMUM PIPE SIZES* (Drawing 14-1899) for heater capacities, pipe lengths, and pressures.

Where LPG (Liquefied Petroleum Gas, Propane, Butane) is used as fuel, see the following Drawing 14-3566 *LIQUEFIED PETROLEUM GAS TANK INSTALLATION FOR HUMIDAIRE UNITS AND DRYING HEATERS* for recommended practices.

Emergency shut-off valves should be provided to permit turning off the fuel in an emergency. They should be located so that they are accessible in an emergency situation.

IRI (Industrial Risk Insurers) and some state and local authorities require venting the gas regulator and normally open vent valve.

NFPA (National Fire Protection Association) 86* states:

3-3.4.3.2 Regulators shall be vented to a safe location, where vented gas cannot re-enter the building without extreme dilution. The terminating end shall be protected against water entry and bug-screened. Vent pipe shall be of adequate size so as to not lengthen response time.

3-3.4.3.3 Vent lines from multiple regulators, where manifolded together, shall be piped in such a manner that diaphragm rupture of one will not backload the others.

3-3.4.3.4 Vents from gas pressure switches, but from no other devices, may be vented into the regulator lines provided that switch or regulator diaphragm failure will not backload the regulator.

* Reprinted with permission from NFPA 86-1985, Standard for Ovens and Furnaces, copyright © 1985, National Fire Protection Association, Quincy, Mass. 02269. This reprint of material is not the complete and official position of the NFPA on the referenced subject which is represented only by the standard in its entirety.

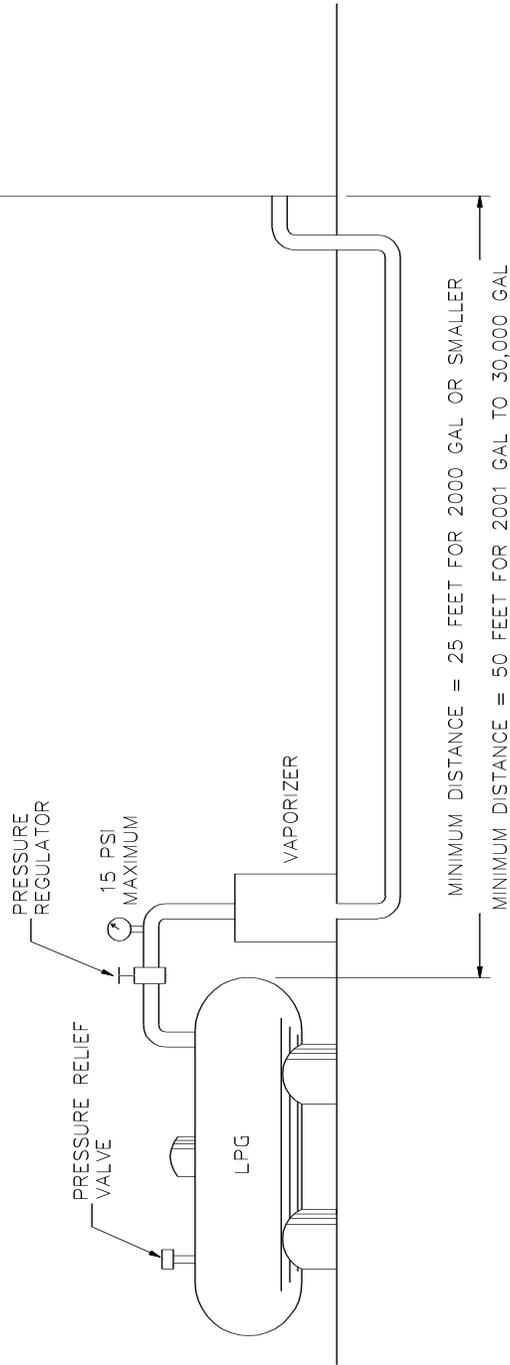
TOTAL HEATER CAPACITY MILLION BTU/HR	PIPE LENGTH FEET	RECOMMENDED MINIMUM PIPE SIZES				
		PRESSURE AT SERVICE REGULATOR OR VAPORIZER OUTLET, PSIG				
		NATURAL GAS			PROPANE *	
		6	10	15	10	15
2	100	1-1/4	1	3/4	3/4	3/4
	200	1-1/4	1	1	3/4	3/4
	500	1-1/2	1-1/4	1	1	3/4
4	100	1-1/2	1-1/4	1	3/4	3/4
	200	2	1-1/2	1-1/4	1	1
	500	2	1-1/2	1-1/4	1-1/4	1-1/4
8	100	2	1-1/2	1-1/4	1-1/4	1
	200	2-1/2	2	1-1/2	1-1/4	1-1/4
	500	3	2	2	1-1/2	1-1/2
16	100	3	2	1-1/2	1-1/2	1-1/4
	200	3	2-1/2	2	2	1-1/2
	500	4	2-1/2	2-1/2	2-1/2	2
24	100	3	2-1/2	2	2	1-1/2
	200	4	3	2-1/2	2-1/2	2
	500	5	3	2-1/2	2-1/2	2-1/2

* OR BUTANE

FILE: 14-1899

PIPE SIZES ARE NOMINAL DIAMETERS, SCHEDULE 40, AND ARE BASED ON 5 PSIG BEING REQUIRED AT INLETS OF COMBUSTION REGULATORS.

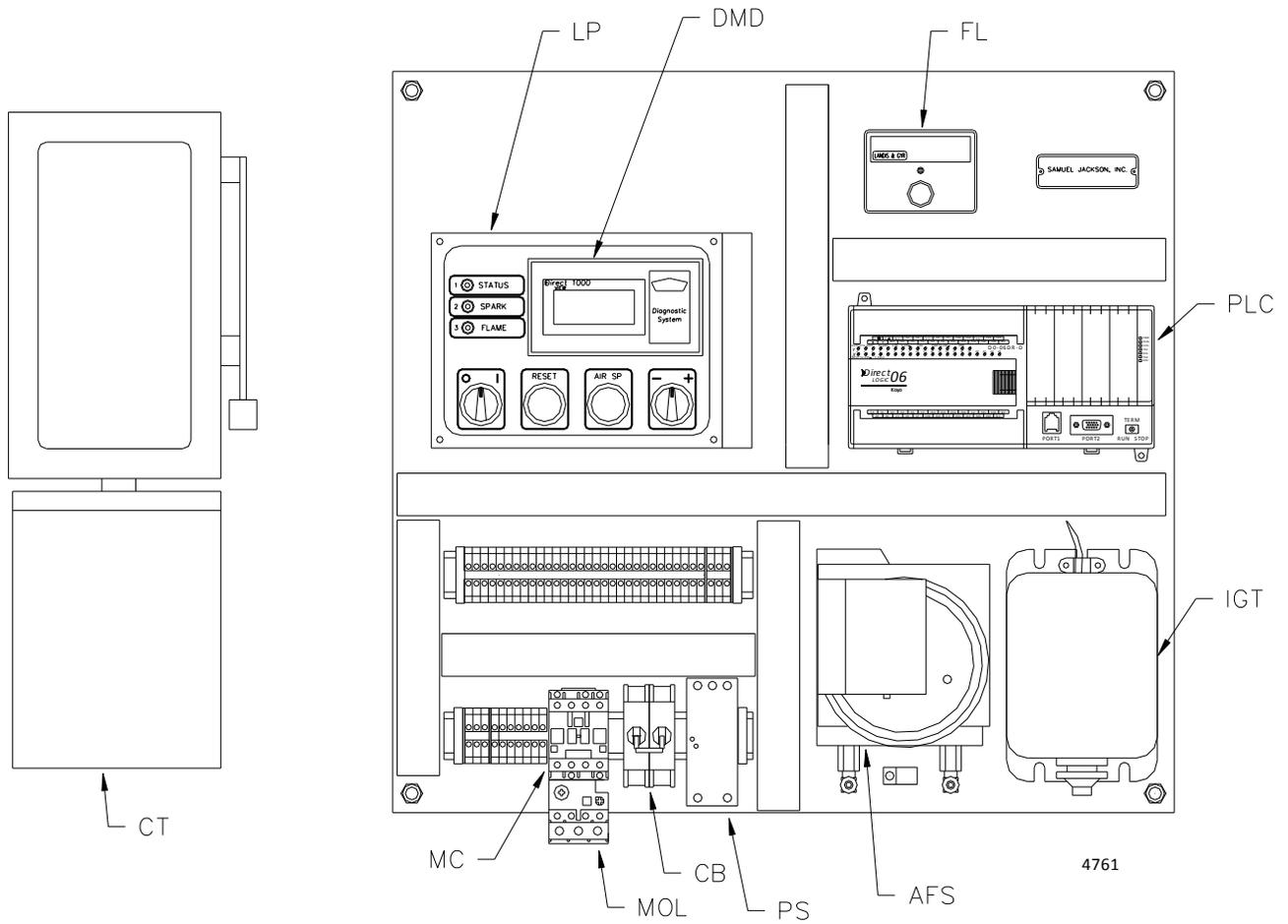
Liquefied Petroleum Gas Tank Installation for Humidair Units and Drying Heaters



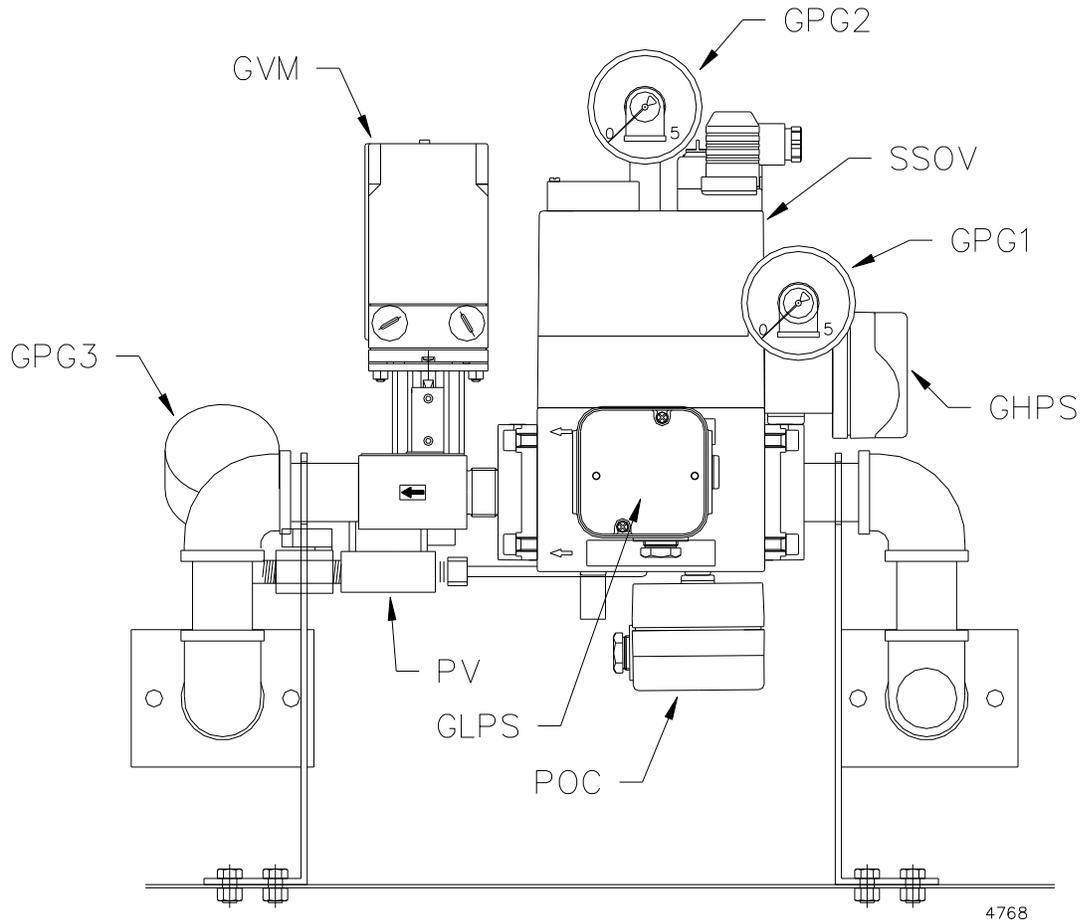
For LPG installations, the tank should be at least 1200 US gallons to provide adequate surface area to absorb heat of vaporization from the atmosphere. To be compatible with the quantity of LPG received in each delivery, a larger tank may be necessary. A battery of small tanks of the desired total capacity has more heat-absorbing area than one large tank.

Whether or not a vaporizer is used, make sure that a regulator reduces the pressure to 15 psi (1 bar) BEFORE the pipe goes underground. Otherwise, reliquefaction will take place in the cool earth and cause MUCH trouble. If the gas line in the building feels extremely cold during operation, liquid is in the line and the situation should be corrected immediately.

14-3566



Heater Electrical Cabinet Component Labels



Heater Gas Train Component Labels

HEATER COMPONENT LIST

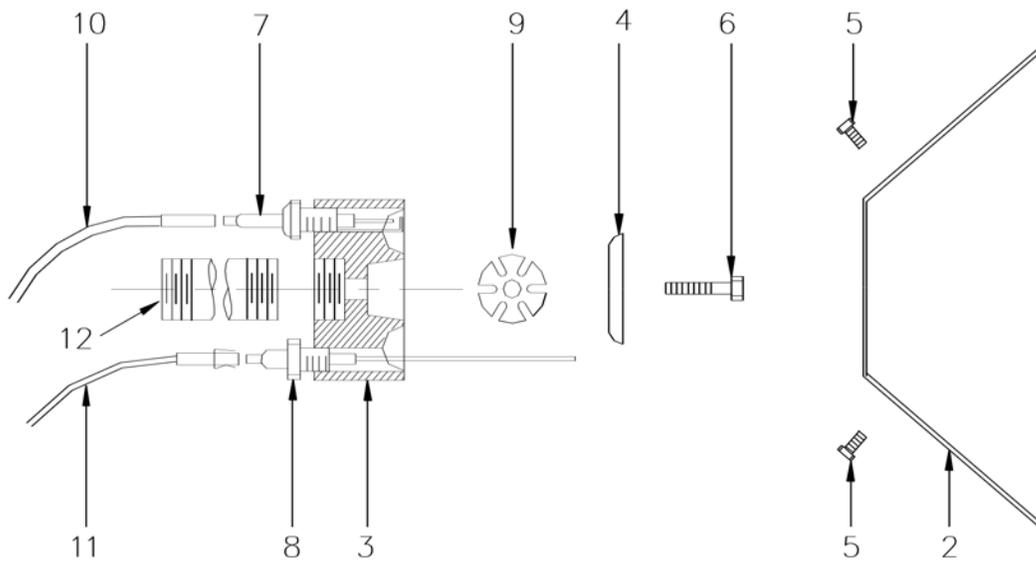
<u>SYMBOL</u>	<u>PART NAME, NUMBER, MFR'S TYPE</u>	<u>LOCATION</u>
AFS	AIR FLOW SWITCH 16188, PC-301	UPPER CABINET
CB	CIRCUIT BREAKER 22175, DOUBLE POLE 5A	UPPER CABINET
CT	CONTROL VOLTAGE TRANSFORMER 16480A, 500 VA, E500TF	BOX BELOW DISCONNECT
DMD	DIAGNOSTIC MODULE DISPLAY 19642, DV-1000	UPPER CABINET
FAN	BLOWER AND MOTOR 20897A, 7H166, 3 HP MOTOR	BLOWER
FE	FLAME ELECTRODE 12399A, CA390	BURNER
FLR	FLAME RELAY 20107, LFE10	UPPER CABINET
GHPS	GAS PRESSURE SWITCH (HIGH PRESS) 21332, D217089 GAO-A2-4-8	LOWER CABINET
GLPS	GAS PRESSURE SWITCH (LOW PRESS) 21332, D217089 GAO-A2-4-8	LOWER CABINET
GPG1	GAS PRESSURE GAGE, (0-5 PSI), (1) 19188, BCM DIAPHRAGM	LOWER CABINET
GPG2	GAS PRESSURE GAGE, (0-5 PSI), (1) 19188, BCM DIAPHRAGM	LOWER CABINET
GPG3	GAS PRESSURE GAGE, (0-5 PSI), (1) 19188, BCM DIAPHRAGM	LOWER CABINET
GPR	GAS PRESSURE REGULATOR 21347, 143-80-2HP	OUTSIDE CABINET
GVM	GAS VALVE MOTOR WITH VALVE 21330, 46050-3 DMA30B120 (MOTOR) 21608, D237614 DMK710/6 (VALVE)	LOWER CABINET
IGP	IGNITER PLUG 12398A, CA475	BURNER

<u>SYMBOL</u>	<u>PART NAME, NUMBER, MFR'S TYPE</u>	<u>LOCATION</u>
IGT	IGNITION TRANSFORMER 21706, 2260-TW	UPPER CABINET OR BURNER
LP	LOCAL PANEL, COMPLETE, 21021, SJMC	UPPER CABINET
MC	BLOWER MOTOR CONTACTOR 22072, LC1D25 110/120	UPPER CABINET
MOL	BLOWER MOTOR OVERLOAD 22616, LRD10	UPPER CABINET
PLC	PROGRAMMABLE LOGIC CONTROLLER 21562, DL06 PLC COMPRISED OF 19857, 21563, 21564, 21565, 21566	UPPER CABINET
POC	PROOF OF CLOSURE SWITCH 21328, D224253 CPI-400	LOWER CABINET
PS	POWER SUPPLY, 120VAC TO 24VDC 21553, IDEC PS5R-SD24	UPPER CABINET
PV	GAS PILOT VALVE 21352, 8040H7	LOWER CABINET
SSOV	DOUBLE SAFETY SHUT-OFF GAS VALVES 21326, D224843 DMV-D702/602	LOWER CABINET
TCA	THERMOCOUPLE (AIR) 21708, EXPOSED TIP, 4-20mA TRANSMITTER TYPE (BLUE)	DISCHARGE AIR

13480A BURNER HEAD ASSEMBLY

3131A

8-92



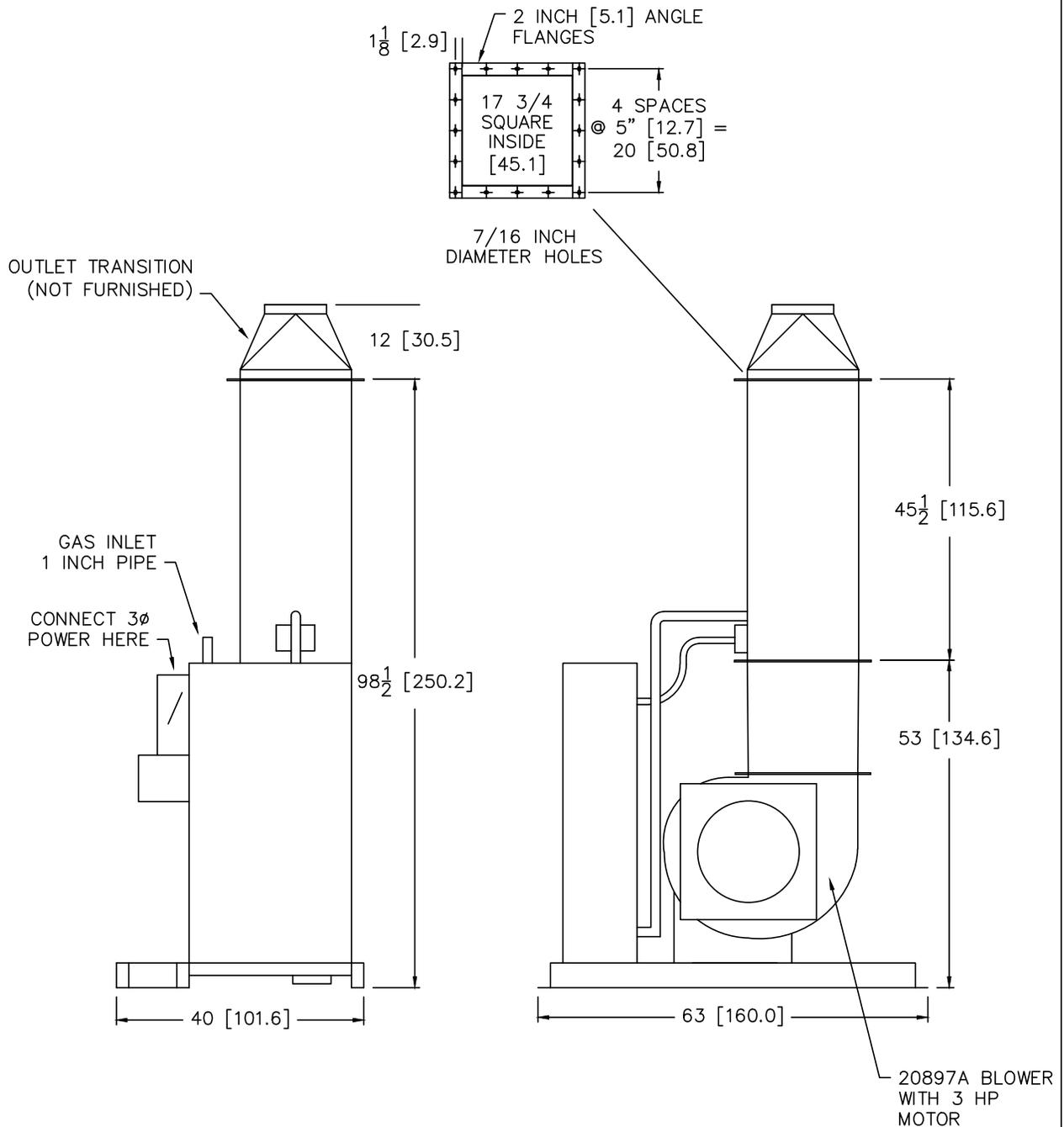
TOP VIEW

REF	QUANTITY	PART NO.	DESCRIPTION
2	1	12975B	BURNER CONE
3	1	14620	BURNER BODY (FOR LPG; USE 18000 FOR GAS)
4	1	12985B	CONTOURED DISC
5	4	15724	5/16 X 1/2 HX HD SS CAP SCREW
6	1	15767	3/8 X 1 3/4 HX HD SS CAP SCREW
7	1	12398	SPARK PLUG, I-64-1
8	1	12399	FLAME ELECTRODE, FRS-2-6
9	1		BURNER ORIFICE DISC:
			<u>SLOT</u> <u>THICK</u> <u>FLOW AREA</u>
		18031	.080 .048 15
		18032	.114 .048 21
		18033	.103 .075 30
		18034	.149 .075 43
		18035	.216 .075 63
		18036	.179 .135 94
		18037	.286 .135 149
			PARTS NOT INCLUDED IN 13480 BURNER HEAD:
10	1	11159	SPARK PLUG WIRE
11	1	11158	FLAME ELECTRODE WIRE
12	1	15189	1 1/4 X 4 BLACK PIPE NIPPLE

DIMENSION SHEET FOR HG-1-1501
1 MILLION BTU/HR GAS-FIRED HEATER
PUSH THROUGH

CA13504A

6-12



DIMENSIONS IN INCHES [CENTIMETERS]

LIMITED WARRANTY

SAMUEL JACKSON, INCORPORATED

For Commercial and Industrial Customers of Samuel Jackson Moisture Control Products

SAMUEL JACKSON, INCORPORATED ("Sam Jackson") warrants to its customers who purchase Sam Jackson products that its equipment is free from defects in material and workmanship under normal use and service for 12 months from the date of shipment from its Lubbock, Texas factory.

THIS WARRANTY DOES NOT EXTEND TO EQUIPMENT SUBJECTED TO MISUSE, NEGLIGENCE, OR ACCIDENT; NOR DOES THIS WARRANTY APPLY UNLESS THE PRODUCT COVERED BY IT IS PROPERLY INSTALLED BY A QUALIFIED, COMPETENT TECHNICIAN, WHO IS LICENSED WHERE STATE AND LOCAL CODES REQUIRE, AND WHO IS EXPERIENCED IN MAKING SUCH INSTALLATIONS.

Equipment, which is defective in material or workmanship and within the warranty period, will be repaired or replaced, at Sam Jackson's option, in order to facilitate proper operation.

THIS WARRANTY IS LIMITED TO THE PRECISE TERMS SET FORTH ABOVE, AND PROVIDES EXCLUSIVE REMEDIES EXPRESSLY IN LIEU OF ALL OTHER REMEDIES, AND IN PARTICULAR THERE SHALL BE EXCLUDED THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT WILL SAM JACKSON BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY NATURE.

Sam Jackson neither assumes nor authorizes any person to assume for Sam Jackson any other liability or obligation in connection with the sale of this equipment. Sam Jackson's liability and Customer's exclusive remedy being limited to repair or replacement as set forth above.

SAMUEL JACKSON, INCORPORATED
3900 Upland Avenue Lubbock, Texas 79407

IMPORTANT!

The following notice affects your warranty.

Electrical Controls and Your Safety

Your new Sam Jackson product may be equipped with electrical controls, or designed to interact with controls on a related Sam Jackson product.

In the event that local, state, federal or other specified safety compliance is required, we will consider modifications to meet the particular requirements. Implementation of alternative safety devices may incur additional charges. No warranty of compliance with a particular standard is made in the absence of specific reference to it in our quotation.

If you modify, or permit others to modify, these controls without specific written permission from Sam Jackson, Inc. the warranty on your product will be void and there is a possibility of serious damage to machinery, damage to product, serious injury to personnel, or death. The modifier of the controls assumes all liability for these consequences.

Samuel Jackson, Incorporated
3900 Upland Avenue
Lubbock, Texas 79407
806-795-5218